

**Questions and Answers
Concerning**

**ECONOMIC IMPACTS OF THE DROUGHT IN
WASHINGTON STATE**

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Washington is currently experiencing a serious drought, one that initially looked to be one of the worst droughts on record. Spring rains have lessened that threat somewhat, particularly in Western Washington, but prospects are for serious water shortages in several key parts of the state. However it ultimately unfolds, the drought will have an impact across the state and the Pacific Northwest, with some regions and industries being affected more than others. In response to the dry and warm conditions this winter resulting in an abnormally low snowpack, a statewide drought emergency was declared on March 10, 2005.

The drought could affect approximately 5 to 8 percent of the state's agricultural production, and exacerbates the existing economic challenges that Washington's farmers are experiencing. Ripple effects will be felt throughout the economy, including food processing and other agriculture-dependent industries.

The following questions and answers provide basic information on the drought situation, outline the industries most likely to be directly affected by the water shortage, and assess the potential economic impacts of the drought. The state also will conduct a more comprehensive analysis of the actual economic impacts of the drought at a later date. That analysis will include an investigation of the effectiveness of drought indicators and responses, as well as strategies to mitigate the effects of future droughts.

As this report is prepared, it is not possible to fully predict all the economic effects of the drought. Early spring rainfall has already reduced the impacts that would have been predicted in mid-March. Rains at critical periods during the spring and summer could significantly reduce the effects of the drought. However, current projections are that summer water availability will be reduced in the non-irrigated farmlands, especially the wheat growing regions in southeastern Washington, and in the junior, pro-rated irrigation districts, especially the lower Yakima River.

1. How serious is the state's drought situation?

As late as mid-March 2005, Washington appeared as if it could be entering its worst drought in recent times. Statewide precipitation totals for the period from December 2004 through February 2005, while not as low as in some previous dry winters, were still well below average. By mid-March, precipitation for approximately three-quarters of the

state was less than 70 percent of normal, with some parts of Eastern Washington dropping to less than 50 percent of normal. Since then, a change in the prevailing weather pattern has returned the state to more normal conditions and precipitation levels have improved dramatically. In fact, for many parts of the state, both April and May were months of above-average rainfall and, in some areas, well above average.

In addition to the unusually dry winter months, Washington was much warmer than normal during those same three months. This warming dramatically affected what there was of the state's snowpack, which is now the primary cause for concern. Not only did the winter snowpack fail to approach normal levels, but the warmer temperatures caused it to begin melting earlier than is typical. The snowpack at many sites was the lowest on record and the prospects for complete recovery to normal levels were slim.

The lack of overall precipitation had a major effect on stream flows in the state's rivers, especially in Western Washington. Except during the brief periods immediately following rainstorms, many set a succession of new record daily low flows.

In response to the unusually dry overall conditions, Governor Christine Gregoire authorized the Department of Ecology to declare a drought emergency on March 10, 2005. Ecology immediately issued a declaration for a statewide drought emergency, based on the extremely low snow pack in the mountains and record-low flows that were seen in many rivers across the state.

The change in the prevailing weather pattern that began in mid-March has continued into June. It has reduced but not eliminated the potential for a serious drought. The result of the change is that precipitation for the months of March, April, and May has been essentially normal or better. The state's snowpack, which was at a record low in early March, only recovered slightly as a result of heavy late-season snowstorms, and never really approached normal levels.

2. How long do we expect the drought's impact to persist?

It is difficult to predict the length of the drought. Already, above-normal precipitation in March, April and May has reduced potential drought impacts, especially in Western Washington. Normal precipitation could resume this fall, indicating a return to typical water conditions across the state and refilling many reservoirs and rivers. Right now, however, some streams and reservoirs are so low that even with normal precipitation for the rest of spring and summer, levels may not return to normal before autumn.

Recent drought events in Washington have tended to be single-year occurrences; however, it is not unusual for a drought pattern to persist for several years. Washington could experience three to five years of below-normal precipitation. Clearly, any additional period of below-normal precipitation will delay recovery and prolong the effects of the drought.

Even if the drought is a one-year event, its effects could last for several years. For example, the effects on agricultural production may persist in the following ways:

- Crops planted in the fall 2005 and early winter may not find sufficient soil moisture to germinate and grow, affecting the 2006 harvest.
- Perennial crops may be killed by the lack of water and have to be replanted while harvest from surviving plants may be reduced for the next year or two. This will incur significant cost and the loss of any profits for 3-5 years.
- Fields that are not farmed are subject to greater erosion, colonization by noxious weeds, and other problems that could reduce their value for farming in the future.
- Reduced harvests will depress farm and land values, further stress farmers financially and may lead to long-term or permanent reductions in Washington agriculture.
- Reduced agricultural production could reduce the supply to food processors, resulting in production cutbacks and that could affect the long-term viability of these plants.

Similarly, the effects of the drought on generating hydroelectricity may persist for several years if state rivers and reservoirs do not refill when normal precipitation resumes.

3. Which industries and economic activities are most affected?

A sustained lack of snow and rain may have widespread effects on various industries in Washington, including agriculture and agriculture-dependent industries, other water-intensive industries, fish, generation of hydroelectricity, recreation and transportation. In general, the drought potentially affects three types of economic activities:

- Activities in which water as a significant input in the production process,
- Activities directly related to river flow, and
- Activities dependent upon the existence of the prior two activities.

Agriculture is the industry most heavily affected by drought. The state's food and agriculture industry supports more than 180,000 jobs around the state and generates 13 percent of the state economy. Almost 70 percent of Washington's crop value (\$3.6 billion) comes from the 27 percent of harvested cropland that is irrigated. This includes the most valuable crops: Apples, cherries and other tree fruit; vegetables; onions; and potatoes. Per acre, irrigated crops are worth almost seven times more than crops from non-irrigated land.

In Washington, the orchard industry is the largest single user of irrigation water, consuming 22 percent of total irrigation water. For those farmers, the availability of

water is critical for the long-term viability of orchards. Virtually all vegetable crops (e.g., potatoes, carrots, and asparagus) and fruit (e.g., apples, cherries, grapes, etc.) depend on irrigation.

Water shortage-induced decreases in commodity yields reduce the need for farm workers. Industries dependent upon the output of the state's agriculture sector also will be exposed to economic disruption related to the drought. Many of Washington's crops are processed; especially frozen potatoes and vegetables, so smaller harvests could result in reduced production by the processors, reduced employment, and reduced economic viability of the processing plants. Other industries directly affected by reductions in agricultural production are agriculture services, transportation and warehousing.

Low water levels in Washington's rivers and reservoirs also harm fish recovery and hydroelectric generation. Irrigation, fish recovery measures, and electric generation are closely related in a drought situation. An increase in any one of the water uses affects the water available in the rivers for other uses.

Roughly three-fourths of the electricity in the Northwest is provided by hydroelectric power. The drought directly impacts the amount of electricity that our dams can produce in two ways: Low stream flows affect current hydroelectric generation, and the low snowpack will affect both hydroelectric generation throughout the summer and storing water to meet future electricity loads. Replacement energy can be purchased from other sources, but at a higher price.

Other industries that are water-intensive also may be impacted by the drought, particularly if the drought persists for more than one year and ground water levels are affected. Water-intensive industries include electronic component manufacturers, pulp and paper mills, chemical plants and petroleum refineries.

Activities directly related to river flows are difficult to identify and even harder to quantify. Water transportation services are directly affected by reduced flow in the Columbia and Snake rivers. Recreation activities also may be affected by reduced stream flows in state river basins.

4. Which areas of the state are most affected by the drought?

As has frequently been the case, the Yakima basin looks like it will once again be seriously affected by this year's drought. The Yakima basin is highly developed, with irrigated agriculture constituting the largest economic sector in the basin. Irrigators are highly reliant on the availability of water from the Yakima Basin Project, operated by the U.S. Bureau of Reclamation (USBR), which has five storage reservoirs in the basin. Unfortunately, reservoir storage alone can satisfy only about 40 percent of the water needs of the basin. What's more, the reservoir system possibly may not even refill this year. The difference between reservoir storage and water demand for the basin is normally made up in large part through by the snow melt from the surrounding mountain snowpack. Water from snow melt effectively functions as the basin's sixth, and by far

largest, reservoir. However, this year, the basin's snowpack is a third or less of average and has already essentially completely melted out. The reduced snowpack, in particular, combined with the uncertain reservoir storage, creates the prospect of inadequate water supplies for several irrigation districts in the basin. The Rosa Irrigation District, with all of its water entitlement proratable, already started restricting water supply.

Other parts of Eastern Washington will see junior water right holders being prevented from using water due to low stream flows. Already, some water restrictions are in effect in the Little Spokane, Methow, Okanogan and Wenatchee river basins. Without unusually high precipitation this summer, Ecology may have to restrict water use in some basins, such as the Colville River, where regulation to protect instream flows has never before been necessary.

Furthermore, very low stream flows are projected to occur in some Western Washington rivers, particularly in late summer. Low flows at that time may create passage problems for in-migrating fish trying to pass physical barriers and may increase water temperatures, creating thermal barriers for migration and increasing susceptibility to various types of fish disease.

Municipal water systems that rely on surface water could encounter problems during the same time, both with overall water availability as well as sediment-laden or "turbid" water supplies.

5. How is agriculture affected by the drought?

Drought has two major effects: Low mountain snowpacks reduce water for irrigation, and low precipitation reduces soil moisture for dryland crops, primarily wheat. The Cascade Mountain snowpack provides storage for water that is released during the spring and early summer to irrigate Washington farms through a system of reservoirs and distribution systems. This relatively reliable water supply has allowed the arid fields of Eastern Washington to become some of the most productive and diverse agricultural lands in the United States.

Total precipitation, snowpack and stream flows are important predictors of water availability; however, growing crops depends on having adequate water at critical times in a crop's growth cycle, regardless of the source. Therefore, a few soaking rains during the spring and summer can significantly reduce the adverse effects of drought. However, such rains are not predictable and cannot be relied upon. Similarly, cool, calm weather reduces water loss and mitigates drought impacts while dry, windy weather accelerates evaporation, exacerbating drought effects.

The greatest impacts will be to those irrigation districts that rely most heavily on Cascade Mountain snowfields and those with junior water rights. The largest economic impacts will be in the lower Yakima River basin where water allocations to junior water right holders are expected to be only about 40 percent of normal. This area produces more than \$1 billion worth of apples, cherries, vegetables, hops, concord and wine grapes,

dairy products, etc. All these crops will likely experience some drop in production and increased production cost. Many apple orchardists are exercising triage already – removing blocks of trees and heavily pruning others to provide water for their most valuable trees and keep the others alive. Cherries will have been harvested by the end of July before the drought has its greatest effect, while apple trees will be putting on fruit and under the greatest stress in late summer. Wine grapes, a desert species, should experience limited effects.

Other irrigated areas, especially those in the Columbia Basin Project area will be largely unaffected. They derive water from the upper Columbia River from snowpacks in southern British Columbia, which are in relatively good condition. These include the major potato, onion and sweet corn growing areas.

Non-irrigated agriculture is dominated by wheat and its rotational crops of barley, canola, peas and lentils. Wheat planted in the winter was affected by poor winter and spring moisture, but recent rains have resulted in rapid growth, and harvest is expected to be slightly above last year's. Spring plantings were 165,000 acres below the previous years due to drought concerns when surveyed in March, however, the recent rains have encouraged more planting. The lack of deep moisture in the soil remains a major concern and the crop will have to rely on unpredictable rain occurrences this summer.

Livestock producers also face increased costs and reduced production. Without rain, pastures are less productive, necessitating the purchase of animal feed. And water may not be sufficiently available on the range. The growth and yield of these farm animals will be reduced, and disease problems will increase.

Increased risk of disease, insects, noxious weeds, erosion, and fire resulting from abandoned fields, incur additional costs to farmers. Without maintenance of the fields or removal of abandoned orchards, the risk of damage to adjoining fields is significant. State and federal fire officials are preparing for a potentially record year for forest and range fires.

6. What factors determine which farms are most at risk?

The most important factor affecting a farm's drought risk is its source of water. Farms with "junior" water rights stand to lose water first in a drought situation, while those with "senior" water rights are likely to retain a larger percentage of the water normally used for irrigation. Some farms have access to supplemental wells or emergency wells authorized for use by Ecology. Pumping costs may be prohibitive while new wells may cost more than \$50,000 to install.

Water intensive, annual crops are the most likely to be sacrificed to protect perennial crops. For example, potatoes are one of the most water-intensive crops and many farmers will curtail growing potatoes on some acres to save water. Orchards or vineyards can cost more than \$15,000 dollars per acre to replace and take years to reach full production so

farmers will shift water where possible to protect their long-term investment in these plants.

The ultimate measure of risk is the financial condition of the farm business. A very successful farm, or one that has just had a good harvest, may have the financial resources to buy water, implement water management and conservation activities or survive with a reduced harvest. A farm, especially a small one that is already struggling, does not have these options.

7. How did the 2001 drought affect the state?

Although all drought occurrences are different, there are similarities between the statewide drought of 2001 and the current drought. In both cases, the forecasts as of March 1 were for very low streamflows during the summer months. However, overall precipitation was lower in March of 2001 while the snowpack was higher.

Analysis of the employment data during the 2001 drought showed no discernible visible impact on employment in water-dependent industries. However, because a number of other factors were at play, such as the overall economic recession, it is very difficult to isolate and attribute employment impacts caused specifically by the drought.

In agriculture, droughts are not uncommon, and farmers have learned how to deal with them from past experience. In 2001, under drought conditions, the total value of crop production still managed to increase 6 percent, a result of the combined effect of a 3 percent increase in quantity produced and a 3 percent price rise. The drought had a limited effect on Washington's agriculture; a few crops (e.g. lentils, green peas for processing, strawberries, peppermint, hay, sugar beets, onions, etc.) even had record production yields (i.e. quantity harvested per acre) in 2001 and the following two years. Two major crop commodities in the state, apples and potatoes, both with more than 95 percent of harvested fields on irrigated land, did suffer a cutback in production acres of 5.9 and 8.6 percent, respectively.

Potato production declined by 2 percent and apples declined about 10 percent. However, the losses in harvesting acres and yields were more than offset by soaring price rises in that year – 42 percent for apples and 38 percent for potatoes; and the result was a 20 percent and a 24 percent increases in the production value of apple and potatoes, respectively, in the state. In 2001, policies that were activated by the declaration of a drought emergency helped to assure the efficient use of available water and farmland in the state.

8. What is the potential economic impact this year on agriculture and related industries?

The drought of 2005 may well have significant impacts on the economy of the Pacific Northwest, especially in rural communities where most of the affected industries are located. Since water shortages have a major impact on hydroelectric generation and energy prices are likely to increase. Adding to the problem are the recent escalating costs of other necessities, such as fuels and fertilizers.

Agriculture and agriculture-related food processing, warehousing, and transportation industries are likely to see significant impacts. However, private and government actions are likely to lessen the drought's potential severe impact on agriculture and related industries. These actions include Ecology's steps to facilitate the transfer of water, as well as aggressive efforts by farmers, irrigation districts and utilities to trade and use water more efficiently. Still, the impact is expected to be significant, with about 5 percent to 8 percent of the state's crop production likely to be affected.

In order to estimate the impacts at this time, several assumptions have to be made:

- Precipitation will continue between normal and drier than normal;
- Non-irrigated crops will respond as they did in the previous droughts of 1977 and 1994;
- Major effects will be on those irrigated lands with junior, prorateable water rights.

Based on the effects of the 1977 and 1994 droughts on dryland agriculture, a 10 percent to 20 percent reduction in harvest would be expected. For example, spring wheat plantings as of March were down 165,000 acres, equal to about \$36 million. Spring rains, unlike in the previous droughts, improved the winter wheat crop to normal and encouraged spring plantings, which should reduce the final impacts. For this analysis, however, the estimated impact on wheat is between \$52 and \$104 million in reduced harvest.

For irrigated crops, estimating drought impact depends on the crop, natural precipitation during the growing season, and how farmers respond to reduced water. The greatest impact will likely be in the lower Yakima River basin where the Northwest Economic Associates' study of possible reductions predicted that a 60 percent to 70 percent reduction in available water— which is expected under current drought conditions – would result in about an 11 percent to 15 percent loss in the value of crops, or \$143 million to \$195 million.

Altogether, the estimated impact on agricultural production in 2005 due to drought conditions is between \$195 and \$299 million, or between 5 percent and 8 percent of total Washington crop production.

Using the state Input-Output economic model, this decline in the value of agricultural output is equivalent to about 3,500 to 5,400 fewer agricultural jobs in 2005 than would have been expected in a normal water year. An additional 700 to 1,100 jobs are at risk in the near term in food processing, wholesaling, trucking, warehousing and transportation services.

If drought conditions continue to affect agricultural production in 2006 and 2007, the secondary or “multiplier” effects of agriculture related job losses would result in an additional 3,800 to 5,900 job losses in construction, retailing, services, and other sectors.

These estimates do not include the longer-term economic losses resulting from a one-year loss of perennial crops. Perennial crops comprise a large proportion of irrigated land. When these plants die, replanting and lost harvests over the next four to five years could exceed \$15,000 to \$20,000. If 5 percent of the state’s orchards were lost, the cost over the next four to five years may be an additional \$600 to \$800 million.